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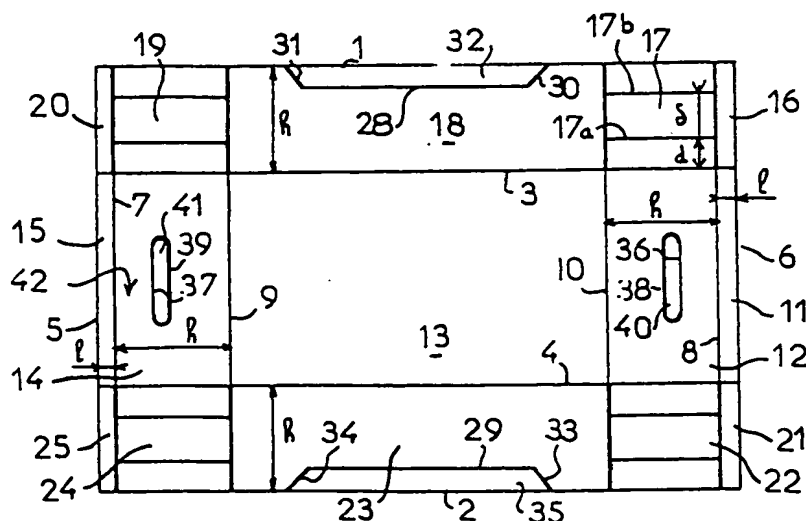
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(54) A stackable tray

(57) A tray formed from a blank of plastics or water-impermeable cardboard comprises a horizontal polygonal base 13 and vertical walls 12, 14, 18, 23 joined to this base and to each other, there being provided at the junction of adjacent walls a hollow vertical pillar (45, figure 6, not shown) defined at least partially by at least one

vertical wall or an extension thereof, the volume occupied by each pillar being small relative to the volume of the tray. Preferably, each pillar-forming extension 17, 19, 22, 24 is divided into three portions by vertical fold lines 17a, b, the portion hinged directly to the one wall 12 being glued to the adjacent wall 18, whilst the furthest portion from that hinge line 3 is glued to the one wall. A horizontal flap 11, 15 may be hinged to the upper edge of a wall 12, 14 and extend between a pair of pillars (45) to close them at the top.

Fig 1



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Fig 1

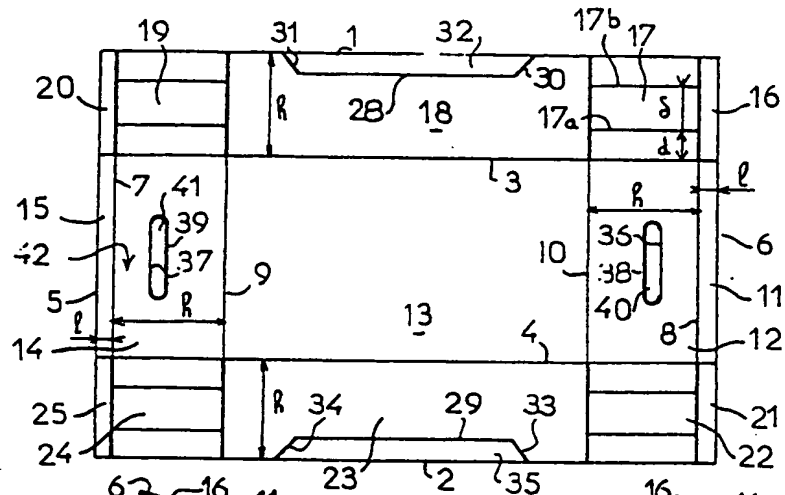


Fig 2

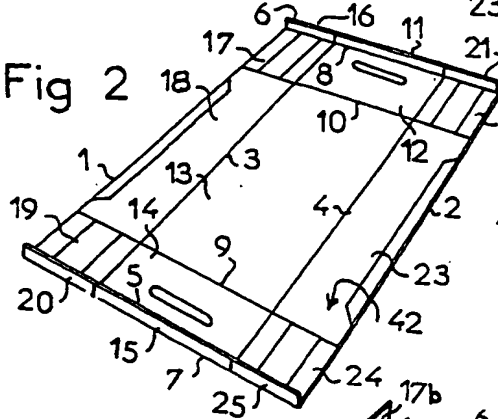


Fig 3

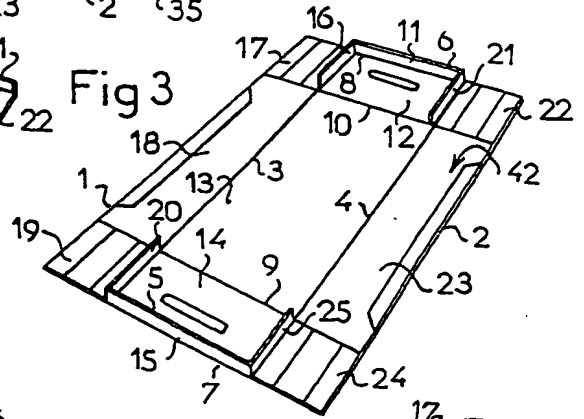


Fig 4

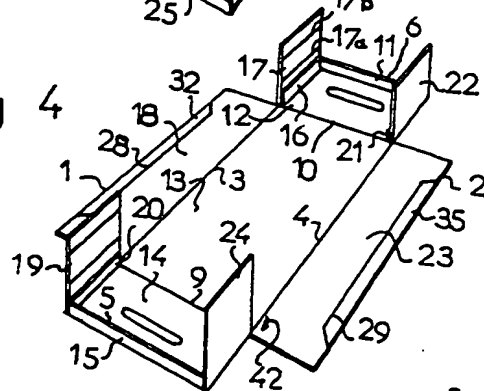


Fig 5

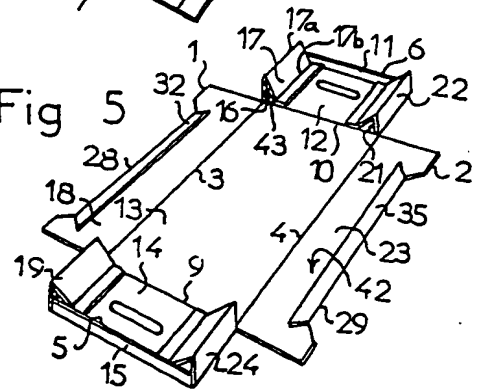
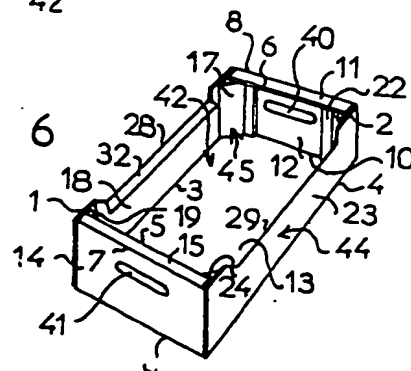


Fig 6



SPECIFICATION

A tray of semi-rigid material and a blank for forming such a tray

This invention relates to a tray of semi-rigid material and a blank for forming such a tray.

The invention is concerned especially but not exclusively with the production of trays sufficiently strong to permit them to be piled up with their loads in stacks and made from a semi-rigid material such as cardboard.

An example of such a tray is one used for storing fruit and vegetables.

Such trays are often formed of thin strips or planks of thin lightweight wood which are assembled by nailing them together or by fastening them to wooden pillars of greater section which provide a vertical reinforcing pillar at each vertical edge of the tray. Thus, these trays can be piled and stacked without risk if one takes the precaution of aligning the pillars of the superimposed trays.

Such trays are generally useful but have the drawback of being expensive due to their fabrication which is mechanically difficult requiring numerous operations.

This drawback lies in the use of wood as the base material, the choice of this material being dictated by the requirement on the one hand of mechanical strength and on the other hand a good resistance to humidity for example to the humidity inherent in vegetables and the humidity of cold storage rooms.

It is known for other applications to form trays of cardboard but these trays do not have the qualities of mechanical strength required to allow them to be stacked or piled in large numbers. They moreover have the drawback that they have poor resistance to humidity.

The aim of the present invention is to permit the formation of trays having the required mechanical strength and resistance to humidity and formed from a semi-rigid material such for example as cardboard.

For this purpose the invention proposes to use an impermeable composite cardboard and to form in this composite cardboard a blank which after folding can be erected into a tray presenting the required mechanical strength.

More generally the object of the invention is to provide a tray which, formed entirely of a semi-rigid material, has sufficient mechanical strength to allow it to be piled and stacked.

According to a preferred form of construction this tray is obtained from a rectangular blank, without trimming which would involve a loss of material, and which can be folded mechanically to be erected into tray form. This results in considerable economy of production of trays according to the invention which offer the same possibilities of use as wooden trays.

The tray according to the invention, formed of semi-rigid material, comprises at least horizontal

polygonal base and vertical flanges joined to the edges of the base and joined two-by-two, the tray being characterised in that it comprises at the junction of two flanges a hollow vertical pillar defined at least partially by at least one vertical skin joined to the base at its lower part and being of a height at least equal to that of the flanges, the skin occupying at least partially a small vertical volume with respect to the internal volume of the tray.

An embodiment of the present invention will now be described by way of example with reference to the accompanying drawings in which:-

Fig. 1 is a plan view of a blank used to form a tray according to the invention;

Figs. 2 and 5 are respective views illustrating the different stages of erection of the tray from the blank; and

Fig. 6 is a perspective view of the tray according to the invention.

Fig. 1 shows a flat rectangular blank formed of a semi-rigid material for example of cardboard or a material based on cardboard.

When the tray is one which is to be used in a humid atmosphere it is preferred to render the cardboard impermeable according to a known method, namely by impregnating it with a polymer such as polyethylene or acetate for example by immersing or spraying it, and interleaving it between two skins of the polymer such as polyethylene applied under the influence of heat for example by calendering.

Other semi-rigid materials may be used for example sheets of plastics material.

The blank illustrated in Fig. 1 adapted to be erected to a tray with a rectangular base itself is of rectangular form.

Parallel with the two long sides 1 and 2 of the rectangle and at a distance h respectively from the sides are provided two fold lines 3 and 4 respectively extending between the two short sides 5 and 6 of the rectangle.

Parallel with the two sides 5 and 6 of the rectangle and at a distance l respectively from the sides, the distance l being less than the distance h are provided two fold lines 7 and 8 respectively, each extending between the two long sides 1 and 2 of the rectangle. Moreover, parallel with the lines 7 and 8 and at a distance h respectively from them, are two other fold lines 9 and 10 respectively whereof each also extends between the two long sides 1 and 2 of the rectangle. The length of each of the fold lines, 7, 8, 9 and 10 located between one of the fold lines 3 or 4 and the adjacent edge 1 or 2 respectively of the triangle is slit and this is indicated by a thicker line in Fig. 1.

The fold lines 3 and 4 define between them and, respectively, with the edge 6 and the line 8 a flap 11 and with the lines 8 and 10 a panel 12 adapted to form one of the walls of the tray, with the lines 9 and 10 the rectangular base 13 of the tray, with the lines and 7 a panel 14 adapted to form a wall parallel with the wall formed by the panel 12, and with the line 7 and the edge 5 of the rectangle a flap identical to flap

11.

The line 3 and the edge 1 of the rectangle define respectively with the edge 6 and the line 8 a tongue 16, with the lines 8 and 10 (the slit portions thereof) a panel 17, with the lines 9 and 10 a panel 18 adapted to form another wall of the tray, with the lines 9 and 7 a panel identical to panel 17, and with the line 7 and the edge 5 a tongue 20 identical to tongue 16.

Similarly the line 4 and the edge 2 of the rectangle define respectively with the edge 6 and the line 8 a tongue 21 identical to tongue 16, with the lines 8 and 10 a panel 22 identical to panel 17, with the lines 4 and 2 a panel 23 identical to panel 18, with the lines 9 and 7 a panel 24 identical to panel 19 and with the line 7 and the edge 5 a tongue 25 identical to the tongue 20.

Each of the panels 17, 19, 22, 24 have a number of fold lines parallel with the lines 3 and 4. In this embodiment there are two fold lines for each panel.

Thus the panel 17 comprises two fold lines 17a and 17b between the line 3 and the edge 1. The distance δ between the lines 17a and 17b is greater than the distance d between the line 17a and the line 3. A similar arrangement of fold lines is provided on the panels 19, 22 and 24.

Parallel respectively with the edges 1 and 2 at a distance e from these edges which is small compared with the distance h are two fold lines 28 and 29 provided respectively on panels 18 and 23, whereof the length is less than the distance separating lines 9 and 10 and which occupy a central position between the latter. The ends of the line 28 are connected to the edge 1 by two straight cuts 30 and 31 respectively, these two cuts defining with the line 28 and the edge 1 a flap 32 of trapezoidal form whereof the short base is defined by the line 28.

Similarly the line 29 is connected to the edge 2 by two straight cuts 33 and 34 which define with this line 29 and the edge 2 a flap also of trapezoidal form with the short base being the line 29.

Moreover, on panels 12 and 14 which are smaller than the panels 18 and 23 are provided fold lines 36 and 37 respectively, parallel with lines 8 and 7 and having a length less than the distance separating the fold lines 3 and 4 relative to which they are centrally located. Each of these fold lines 36 and 37 is extended for a short distance respectively towards the line 9 and towards the line 10 by a straight cut 38 and 39 respectively of the same length and to which it is connected at their adjacent ends by two semicircular cuts. Thus there is defined respectively on the panel 12 and the panel 14 flaps 40 and 41 respectively folded on the corresponding panel about a line adjacent respectively the line 8 and the line 7 and hinged around this line to provide a hand opening.

The folding of the blank which has been described to erect tray form which is illustrated in Fig. 6 will now be described with reference to Figs. 2 to 5.

For clarity the same reference numerals have been used as were used in Fig. 1 to designate the different parts of the tray as it is being erected.

It will be manifest that the erection of the blank into the tray according to the invention only requires simple mechanical operations.

A first stage of erection of the tray from the flat

blank illustrated in Fig. 1 consists in placing the zones located between the line 8 and the edge 6 and between the line 7 and the edge 5 upright at a right-angle relative to the face 42 of the blank adapted to be on the inside of the tray respectively by folding same around the line 8 and around the line 7. The condition of the blank at the end of this stage is illustrated in Fig. 2, where it can be seen that the tongues 16 and 21 are aligned with the flap 11 and similarly the tongues 20 and 25 are aligned with the flap 15.

A second stage whereof the end result is illustrated in Fig. 3 consists in folding towards one another the tongues 16 and 20 by folding around the line 3 respectively relative to the flap 11 and relative to the flap 15 so that the tongues 16 and 20 are at right-angles to their respective flaps. The same operation is effected on the tongues 21 and 25 which are turned towards one another around the line 4 at 90° respectively relative to the flap 11 and the flap 15.

Thereafter, after having applied an appropriate glue to the zones of the face 42 of the blank located on the panel 17 respectively between the line 17a and the line 3 and between the line 17b and the edge 1 and on identical zones on each of panels 19, 22 and 24, these panels 17, 19, 22 and 24 are then each disposed in a position where they are at 90° to the zone of the face 42 corresponding to the base 13 and with which panels 12, 14, 18 and 23 are coplanar. This operation which is effected by folding respectively around the line 3 or around the line 4 brings the glued zone of the panel 17 between the line 17a and the line 3 into contact with the tongue 16 and in similar fashion the glued zone of the panel 19 adjacent the line 3 into contact with the tongue 20, the glued zone of the panel 22 adjacent the line 4 into contact with the tongue 21 and the glued zone of the panel 24 adjacent the line 4 into contact with the tongue 25. These panels and tongues are therefore connected together.

It is to be noted that the distance d separating the line 17a from the line 3 and the lines similar to the line 17a on panels 19, 22 and 24 is at least equal to the distance l and preferably is the same. The distance δ separating the lines 17a and 17b and similar lines on panels 19, 22, 24 is greater than d .

This permits in the illustrated embodiment the different panels 17, 19, 22 and 24 to be folded from the geometric configuration illustrated in Fig. 4 to the geometric configuration illustrated in Fig. 5 where it can be seen that after having folded the panels around their line adjacent the line 3 or the line 4 that is to say around the line 17a for the panel 17 and the same lines as the line 17a for the other panels so as to dispose the zone of the panel 17 between the line 17a and the edge 1 and the identical zones of the other panels 19, 22 and 24 into contact with the panel 12 or 14. There is thus placed the face 42 of the zone of panel 17 between the line 17b and the edge 1 and identical zones in the other panels against face 42 of the panel 12 or 14.

Taking into account the dimensions mentioned above the zone of the panel 17 disposed between the lines 17a and 17b and identical zones of the other panels 19, 22 and 24 take up during the course of this operation an oblique orientation relative to panels 12

and 14. The zone of the panel 17 between the line 17a and the line 3 and identical zones of the other panels 19, 22, 24 are orientated at 90° relative to the panels 12 and 14 and the zones between the line 17b and the edge 1 and identical lines of the other panels and the corresponding edges are flat against and in abutment with the panels 12 and 14 outside a volume such as 43 (in the embodiment of panel 17) defined by the zones of the panel 17 disposed respectively between the fold lines 3, the fold line 17a and between the fold line 17a and the fold line 17b and the panel 12. It is to be noted that in a modification the zone of a panel such as 17 defined by the line 17b and the edge 1, conveniently glued so that it is rendered solid with the panel 12, can be folded towards the interior of this volume provided it is suitably dimensioned.

The final stage of erection is illustrated in Fig. 5 and the tongue 16 is connected with the zone of the panel 17 between the line 3 and the line 17a and immobilised in the interior of the volume 43, a similar arrangement being provided with the three other tongues 20, 21, 25 and the corresponding panels 19, 22 and 24.

In the course of this operation the flaps 32 and 35 are folded by being hinged respectively along the lines 28 and 29 and are connected to their respective panels 18 and 23 by glueing, face 42 against face 42.

During this final stage, leading to the stage illustrated in Fig. 6, the panels 18, 14, 23 and 12 are disposed upright at right angles relative to the zone of the face 42 corresponding to the base by folding respectively around lines 3, 9, 4 and 10. This places the zones of the face 42 on the panels 18 and 23 adjacent to the lines 9 and 10 respectively against the zones of the exterior face 44 of the blank corresponding to panels 17, 19, 22 and 24 disposed between the fold lines of these panels such for example as line 17b of panel 17 and the adjacent edge 1 or 2 respectively. Glue is injected between these zones prior to placing them into abutment to obtain the tray illustrated in Fig. 6. This operation can easily be performed by means of a press of known type comprising a matrix supported on the base, on the face 42, to urge the blank in the form shown in Fig. 5 inside a mould box configured to give the exterior form of the required tray.

In the course of this last operation the different zones of the panels 17, 19, 22 and 24 take up similarly to panels 12, 14, 18 and 23 an orientation at right angles relative to the base 13 and each of these folded panels constitutes on the interior of the tray respectively at each vertical corner a hollow vertical pillar such as 45 (in the case of panel 17) joined to the base 13 at its lower end and supporting at its upper end a flap such as 11 (connecting the panels 17 and 22) or 15 (connecting the panels 19 and 24) defining a horizontal ledge along the upper edge of the vertical wall 12 or 14 of the tray. This ledge closes each pillar at its upper part and facilitates stacking of the trays according to the invention.

Each pillar such as 45 has in the illustrated embodiment a height h identical with the walls of the tray constituted by panels 18, 14, 23 and 12 but the height of these pillars such as 45 could be greater than that

of the walls.

Moreover, it is possible to provide a construction of pillars such as 45 integral with the panels 18 and 23 or even separate therefrom.

Similarly there is envisaged trays according to the invention whereof the bases 13 are in a form other than rectangular for example square, triangular or generally polygonal.

Various accessories can be provided for trays according to the invention as for example the openings 40 and 41 which generally assist handling of the tray. The flaps 40 and 41 may be opened only when the tray is being handled.

Generally the tray according to the invention can vary substantially in the form and even in the method of fabrication.

Tests have shown that the tray according to the invention presents a mechanical strength considerably greater when compared with traditional cardboard trays. Traditional cardboard trays have resisted loads of 50 to 60 kilograms whereas trays according to the present invention have resisted loads of between 250 to 500 kilograms depending on the thickness of the material. There is also improved resistance to humid atmospheres.

CLAIMS

1. A tray of semi-rigid material comprising at least a horizontal polygonal base and vertical walls joined to the sides of the base and to each other, the tray being characterised in that it comprises at the junction of adjacent walls a hollow vertical pillar defined at least partially by at least one vertical wall joined at its lower end to the base and having a height at least equal to that of the walls and having a volume small relative to the interior volume of the tray.

2. A tray according to claim 1 in which the wall defining the column is joined and rendered integral with the two adjacent walls.

3. A tray according to claim 2 in which the wall is constituted by an extension of one of the two walls folded on itself along the vertical lines.

4. A tray according to claim 3, in which the said extension of one of the two walls comprises a fold adjacent this wall glued to the second of the two walls and joined to the latter, a fold glued to the first wall at the interior of the tray and connected to this first wall and at least one fold joining these two folds.

5. A tray according to any one of the preceding claims comprising a horizontal flap closing the said volume at the upper part of the pillar.

6. A tray according to claim 5 in which the horizontal flap is common to two adjacent pillars and extends between them at their upper parts.

7. A tray according to claim 6 in which the horizontal flap is formed by a strip folded on the edge between the corners of the tray corresponding to the two pillars.

8. A tray according to claim 7 in which the horizontal flap prevents towards the base, immediately adjacent two walls joined to the base, two tongues respectively engaged inside the two pillars.

9. A tray according to any of claims 1 to 6, in which a wall is folded on itself face against face

adjacent its upper edge between the two pillars.

10. A tray according to any one of the preceding claims formed of impermeable cardboard.

- 5 11. A blank for erection into a tray according to claim 4 comprising a rectangular sheet of semi-rigid material, a first set of two fold lines parallel to two parallel sides of the rectangle, a second set of two fold lines parallel with the two other sides of the rectangle, a slit provided along the lines of the second set between their intersection with a side of the rectangle and the line of the first set adjacent this side, at least three fold lines parallel to the lines of the first set on each zone defined by a side of the rectangle, the adjacent line of the first set, a line of the second set and the adjacent side of the rectangle, the distance between the first line and the adjacent fold line being less than the distance between the latter and fold line adjacent the side of the rectangle.

12. A blank for erection to a tray according to claims 4 to 8 comprising a rectangular sheet of semi-rigid material, a first set of two fold lines parallel with two parallel sides of a rectangle, a second set of two fold lines parallel with two other sides of the rectangle, a third set of two fold lines parallel with the lines of the second set, between each of the latter and the adjacent side of the rectangle, close to this side, a slit along the lines of the second and third sets, between a side of the rectangle and the line of the first set adjacent this side, and at least three fold lines parallel with the lines of the first set on each zone defined by a line of the first set, the adjacent side of the rectangle, a line of the second set, the line of the third set adjacent the said line of the second set, the distance between the first line and the adjacent fold line being less than the distance between the latter and the fold line adjacent the side of the rectangle.

13. A blank according to claim 11 or 12, comprising immediately adjacent the sides of the rectangle and parallel with the lines of the first set, between the lines of the second set and of a length less than the distance separating these lines of the second set, two fold lines whereof each is connected to an adjacent side of the rectangle by a cut from each of its extremities.

14. A blank according to any of claims 11 to 13, formed of impermeable cardboard.

15. A tray substantially as hereinbefore described with reference to the accompanying drawings.

16. A blank for erection to a tray, the blank being substantially as hereinbefore described with reference to the accompanying drawings.